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courtesy is observed. The nurses, too, never complain of her as they do of other head nurses. She is always at peace with the most obstreperous patient, they all respect her authority and the voice of the roughest man in the charity ward takes on a different quality in her presence. It isn't that she lacks spirit, she has wit and a keen sense of humor, but she's just different someway."

"Yes, I've observed that, too, and wondered," another replied. "tell us, Tarton, Thou Wise One, wherein lies the secret."

"The secret? Are you so lacking in discernment? It's because she is Woman Incarnate!"

THE ADMINISTRATION OF MEDICINES

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(Continued from page 483)

Of the metallic salts the ones which are most frequently administered are the salts of iron. These salts are given either as inorganic or organic preparations. The organic salts are those which are combined with some form of albumin. All iron salts are partly absorbed in the intestinal tract in the form of albuminates. These albuminates are formed by the combination of the iron with the proteid food which may be present in the stomach or intestines, or with the albumins of the cells of the tissues with which they come in contact. When the albuminate is formed by the contact of the iron with the tissue cells as occurs when iron preparations are given in a fluid like water, on an empty stomach, the patient will frequently complain of a burning pain in the stomach.

In giving iron preparations, therefore, the following points must be kept constantly in mind:

(1) The absorption should be aided by giving both fluid and solid preparations in a large quantity (about a glassful) of milk, so that an albuminate of iron will be formed before the drug enters the stomach. In this way, too, the irritating effect on the stomach is avoided.

(2) The iron salts should be given after meals, to avoid irritation, to increase the formation of albuminates and to hasten absorption.

(3) The preparations should be sipped through a glass tube to avoid blackening the teeth by the sulphides of iron which form in the mouth.

THE ADMINISTRATION OF IODIDES

The iodides of potassium and sodium and related compounds are drugs which are given continuously for a considerable length of time. They are rapidly absorbed since they dissociate readily into their iodine and potassium or sodium ions. Because of their rapid dissociation the iodine ions combine readily with the albumins of the cells of the mucous membrane with which they come in contact, forming albuminates. These albuminates are soluble in the excess of albumin with which the cells are bathed and they are therefore readily absorbed.

The combination of the iodides with the tissue albumins often causes the burning pain in the region of the stomach which is occasionally noted after giving iodides.

Rapid absorption is not desired from the iodides, since in most conditions where iodides are used, we desire a continuous, gradual effect for a long time rather than an intense evanescent one.

The slow absorption and avoidance of irritation are best accomplished by giving the preparation before meals in a small quantity (about a wineglassful) of milk, to which a little wine, sarsaparilla or cinnamon water has been added to disguise the taste.

THE ADMINISTRATION OF ALKALOIDS AND THEIR SALTS

The alkaloids are chemical substances which are capable of inducing all the pharmacological effects of the crude drugs from which they are obtained. They are very insoluble substances and are therefore not readily absorbed. They form salts with acids, however, which are very soluble. These salts readily dissociate into their active alkaloid ion and the acid radical ion which are then absorbed. Since the alkaloid salts are the active principles of their crude drugs devoid of all extraneous matter and readily soluble, they are the best preparations from which to obtain rapid reliable effects.

The various salts of the alkaloids vary in their dissociating power in the following order: the hydrochlorides and chlorides dissociate most rapidly, while the sulphates, nitrates and the salts of the organic acids have, respectively, a lower dissociating power so that the alkaloidal salts of the organic acids have a relatively low dissociating power and are therefore slowly absorbed.

When the alkaloidal salts of a drug are administered, rapid effects are usually desired. To obtain these effects they should be administered in a dilute watery solution. The alkaloidal salts should therefore be given in about a wineglassful of water. The bitter taste of most alkaloids is thus greatly lessened, but a little syrup, raspberry juice or cinnamon water may be added with a very bitter alkaloid like strychnine.

It has long been known empirically that very dilute solutions of the alkaloids are the most efficient preparations of these drugs. For example, the popularity of Magendie's solution of morphine sulphate is due to the fact that it is a 1–30 watery solution which is rapidly dissociated and rapidly absorbed. A more dilute watery solution of morphine hydrochloride would be even better. Such solutions are frequently used in Germany.

THE ADMINISTRATION OF GLUCOSIDES

Most of the glucosides are relatively insoluble substances, which are therefore not readily absorbed. They are very slowly absorbed, however, from many of the galenical preparations of their crude drugs such as tinctures, infusions, fluid extracts, etc. We shall consider the administration of these together with the other galenical preparations.

There are, however, a number of new preparations of soluble glucosides such as the digitalis glucosides. Of these perhaps the most commonly used preparation is digalen. Such preparations, which are usually given for rapid effects, should be administered in about a wineglassful of water flavored with just a little syrup.

THE ADMINISTRATION OF GALENICALS

By galenical preparations we mean those preparations of crude drugs made by purely physical means, such as extracts, tinctures, infusions, fluid extracts, etc. These preparations contain the crude drug in a more or less diluted form. Naturally, since a drug can only be absorbed when it is in a fluid form, the fluid preparations are more active than the solid ones. The dilute, watery solutions of drugs, such as the infusions and fluid extracts are the most efficient according to the basic principles which we have previously laid down. The solid preparations will only be active when they are dissolved before administration or in the gastric or intestinal juices.

The effects of the galenical preparations are due to the active principles which they contain. The absorption of these active principles is increased by diluting the dose to be given with water up to a wineglassful, at least. Preparations that have an unpleasant taste should be given in a little syrup, raspberry juice or wine.

The effects from galenical preparations appear very slowly because the active principles which produce their effects are but slowly absorbed from the extraneous matter in which they are contained. For rapid, reliable effects the alkaloidal salts are preferable.

THE ADMINISTRATION OF HYPNOTICS

Most of the drugs used as hypnotics are substances of a comparatively complex chemical structure. They therefore dissociate but slowly into their constituent active ions. Besides, the effects usually desired from the hypnotics are not sudden, evanescent ones but rather continuous effects to last for hours. Such effects are obtained when these drugs are slowly dissociated and therefore slowly absorbed. This can be accomplished when the hypnotics are administered in about a tumblerful of warm milk or in beer, given about a half to two hours before the usual bedtime; the time for administration depending upon the rapidity of absorption of the particular drug.

With a drug like sulphonal which is very slowly absorbed, the rate of absorption may be somewhat increased by diluting the milk in which it is given, with water.

With a drug like chloral it is particularly essential to avoid giving it in water. In such a fluid it becomes more rapidly dissociated and a large number of poisonous chlorine compounds may be formed which would tend to increase the untoward symptoms or even produce mild poisonous symptoms.

THE ADMINISTRATION OF COAL TAR DERIVATIVES AND THE NEWER SYNTHETIC DRUGS

In this group of drugs we include such substances as phenacetine, acetanilid, antipyrine, pyramidon and many of their derivatives. I shall also include in this group salicylic acid and its newer compounds such as aspirin, etc.

The members of this group are all drugs which have a relatively complex chemical structure and are therefore very slowly dissociated and absorbed. Slow dissociation and slow absorption are desired from these drugs. Whenever they are given we desire to obtain a continuous effect for several hours and not an evanescent one. This is accomplished by giving them in a wineglassful of wine or milk. Wine is perhaps preferable as the alcohol would tend to overcome some of the depressing effects which some of the coal tars have on the heart.

With the coal tar drugs slow dissociation and absorption are especially desirable. The effects of most of the coal tar drugs are due to a substance paramidophenol or its derivatives which are formed from them. These substances, which are produced by the dissociation of the coal tar drugs, produce the anodyne effect as well as the depressing effect on the heart and the methaemoglobinaemia. If the drug is slowly dissociated relatively small quantities of paramidophenol and its derivatives are formed at one time, so that the poisonous effects are minimized and a slow, continual anodyne action is obtained.

THE ADMINISTRATION OF OILS

Oils are given either for nourishment or as laxatives. The mode of action of oils differs from that of most drugs. When an oil is ingested it enters the stomach and then passes into the intestines. Here it becomes broken up into fine globules (emulsified) by the bile and pancreatic juices. These globules are then broken up into their constituent fatty acids and then combined again and stored up in the body as adipose or fatty tissue. Many of the fatty acids combine with the alkalies of the intestinal juice forming oleates. Many of these oleates such as ricinoleates, formed when castor oil is given, have a decided cathartic action. Since the oil is first emulsified in the intestines before it is broken up, its action will be facilitated when it is given in the form of an emulsion. This is accomplished by giving the oil in the form of an emulsion with sarsaparilla or in a syrup.

Many oils such as castor oil have a very unpleasant taste which must first be disguised before patients will take it. The taste can be disguised by administering it in the form of a cocktail with wine or lemon juice or in an emulsion with sarsaparilla. In this way the large globule of oil or the individual small globules of the emulsion are coated with raspberry juice, lemon juice or whiskey which come in contact with the taste buds of the tongue and the unpleasant taste of the oil is avoided. In administering oils, such as castor oil, for cathartic effects, it is not essential to have fresh oil. Old rancid oil is often better since it consists mostly of the fatty acids which facilitate the formation of the active oleates.

THE ADMINISTRATION OF HYDROCARBONS

In the group of hydrocarbons we classify such drugs as the paraffins, Russian mineral oil, abolene, liquid vaseline and related substances These substances have recently come into general use as cathartics.

They are especially valuable in chronic constipation and in those cases due to fine adhesions of the intestines. They are not absorbed, the mode of action being due to the very high specific gravity of these substances. Because of their weight they will pass through the intestinal tract, carrying fecal matter along, and overcome the resistance of the intestinal atony and possible adhesions. In administering these substances it is essential to avoid breaking up the hydrocarbons into fine globules (emulsifying it). In such a way the hydrocarbons may become divided in the intestines into small particles separated from one another, each in itself not being sufficiently heavy to induce any effect. The hydrocarbons are, therefore, best given in a wineglass to which nothing has been added except a little peppermint or cinnamon water to overcome the rather bland taste.

HYPODERMIC ADMINISTRATION

Rapid and reliable effects are obtained from any remedy when it is given subcutaneously in a dilute watery solution. The drug to be administered is usually dissolved in sterile water either in the dose occurring in the form of a tablet or taken from a standard stock solution after the required dose has been calculated.[1] Since the dissociation and absorption of the drug usually increases with the dilution of the solution, it is best to fill up the hypodermic syringe with sterile water to its full capacity after it has been filled with the required dose. This increases the absorption and induces more rapid effects.

INTRAMUSCULAR ADMINISTRATION

Administration of remedies intramuscularly produces even more rapid effects than hypodermic administration. The drug is usually given with a hypodermic syringe and a large firm needle which is injected perpendicularly deep into the muscles of one of the buttocks or the anterior aspect of the thighs. The solution of the drug should be well diluted to the full capacity of the syringe to aid absorption. Many substances are given intramuscularly which are quite irritating to the tissues. The irritation is due to the slow absorption of some of the drugs which allows them to remain in contact with the tissues for a considerable time and injure them. By giving such substances well diluted in water, the absorption is aided while the irritation is lessened.

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[1] For methods of calculation and preparation of required doses, see chapter on Solutions in author's *Materia Medica for Nurses*.

Many substances, such as some mercury preparations, are given for slow absorption. This is best accomplished by giving the preparation in oil, a fluid in which very slow dissociation takes place and which is not irritating to the tissues.

Recently there has been quite a tendency to give all needle medication intramuscularly rather than hypodermically because of the surer effects thus obtained.

RECTAL ADMINISTRATION FOR ABSORPTION

Remedies are frequently given by the rectum to obtain general effects, when the patient is unable to take them by mouth.

The drugs may be given in the form of suppositories, which consist of a menstruum of cocoa butter impregnated with the drug. A much more efficient method of rectal administration is by means of rectoclysis or Murphy method.

This method consists of allowing the drug to enter the rectum through a catheter from a specially arranged apparatus at the bedside. The essential feature of this method is that the fluid containing the drug enters the rectum drop by drop so that it may be rapidly absorbed. The drug to be administered is prepared for absorption by remaining in a large quantity (about a pint to a quart) of water. This permits the drug to become thoroughly dissociated into its ions before entering the rectum. Water is the best solvent for administration by rectoclysis. It is much better than normal salt solution which was formerly used, because the blood will not absorb saline solution unless its salt content is less than 0.9 per cent.

Rectoclysis is perhaps the best method for administering all drugs for continual effect since the large quantity of water in which they are administered and the long time it takes to administer them allow the drug to become thoroughly dissociated into its ions thereby being rapidly absorbed and enhancing its efficiency. At the same time chemical changes between the drug and the gastric and intestinal juices are avoided. These factors may often account for the failure to obtain results from many substances. Many remedies, such as the salicylates, are being administered in many institutions by the rectoclysis method. The method will no doubt come more into vogue for the administration of other remedies as well.

ADMINISTRATION BY INHALATION

Many drugs are frequently given by inhalation. The drug to be given is usually dissolved in boiling water which is kept boiling constantly so that steam is formed. The steam is then inhaled while the patient sits under an improvised tent. If an inhalation kettle is not available the drug can be dissolved in a dish of boiling hot water, the steam of which is inhaled.

Some drugs, such as stramonium are frequently given by inhalation. The patient inhales the fumes formed by burning the leaves in a saucer. Much better effects, however, can be obtained by smoking the cigarettes made from such leaves.

ADMINISTRATION BY INUNCTIONS

Drugs are frequently absorbed by the skin when they are given by means of inunctions or "rubbings." The drug is applied in the form of an ointment which is thoroughly rubbed alternately on various parts of the body. Six successive daily rubbings on various parts of the body are considered a course. On the seventh day the patient receives a bath and the course is begun again.

The usual regions of the body where inunctions are applied are the arms, the forearms, the thighs, the chest and back. In giving inunctions the nurse must wear leather gloves to avoid absorbing the drug herself. The efficiency of the inunction method depends largely upon how vigorously the inunctions are given.

ADMINISTRATION BY VAPOR

Many substances such as mercury are frequently given by means of vapor formed by burning some of their preparations. The patient sits in a small closed cabinet over a dish containing the drug which is burned. The vapors thus formed are absorbed by the skin of the patient and produce the effects of the drug.

METHODS FOR INTERNAL ADMINISTRATION OF COMMON REMEDIES (BLUMGARTEN)

Based on Physico-chemical Laws

DRUG	TIME OF ADMINISTRATION	CHARACTER OF MENSTRUUM	QUANTITY OF MENSTRU
Acids Dilute hydrochloric Dilute sulphuric Dilute nitric, etc.	Before or with meals	In water	Large quantity abo glassful
Alkalies Sodium bicarbonate Lime water Calcium salts, etc.	After meals	In water	For effect in stomach in small quantity, wineglassful. For ab tion in a glassful or
Inorganic Salts Sodium sulphate Sodium phosphate Potassium sulphate Potassium bitartrate Potassium and sodium tartrate (Rochelle salt) Magnesium sulphate Carlsbad water Magnesium citrate	In the morning on an empty stomach	In water	For cathartic effect in quantity For diuretic effect, in quantity (tumblerfu
Seidlitz powder		In water	Dissolve each powder to ½ glass of water mix the two togethe
Iodides Nitroglycerine, nitrites, etc.	Before meals	In milk, flavored with sarsaparilla, wine or cinnamon water	Small quantity (wine ful)
Metallic Salts Iron salts Arsenic salts Silver Zinc, etc.	After meals	In milk	Large tumblerful
Alkaloid Salts Morphine, Atropine, Strychnine, Quinine salts, etc.		In water slightly flavored	Wineglassful
Glucosides Digalen, etc.		In water slightly flavored	Wineglassful
Galenicals Extracts Infusions Fluid extracts Tinctures, etc.		In water slightly flavored	Wineglassful to a tumb
Hypnotics Chloral	15 min, before bed-time	In warm milk or beer	Tumblerful
Trional Tetronal Veronal	½ to 2 hours before bed-time		
Sulphonal	2 to 3 hours before bed-time		
Paraldehyde, etc.			
Coal Tar and Synthetic Drugs Phenacetine Acetanilid Antipyrine Pyramidon Salicylates Aspirin, etc.	After meals	Wine or milk	Wineglassful
Oils Olive oil Cod liver oil Castor oil	¾ to 1 hour after meals	In brandy, wine or lemon juice as cocktail or as emulsion	Wineglassful
Croton oil		Dissolved in glycerine or olive oil, or on a piece of bread or sugar	One or two drops
Hydrocarbons Liquid vaseline Albolene Russian mineral oil, etc.		Add just a little peppermint, raspberry juice or cinnamon water	In wineglass withou added fluid excep flavoring

METHODS FOR INTERNAL ADMINISTRATION OF COMMON REMEDIES (BLUMGARTEN)

Based on Physico-chemical Laws

TIME OF ADMINISTRATION	CHARACTER OF MENSTRUUM	QUANTITY OF MENSTRUUM	METHOD OF ADMINISTRATION
Before or with meals.........	In water....................	Large quantity about a glassful	Sipped through a glass tube.
After meals..................	In water....................	For effect in stomach give in small quantity, about wineglassful. For absorption in a glassful or more	
In the morning on an empty stomach	In water....................	For cathartic effect in small quantity For diuretic effect, in large quantity (tumblerful)	
....	In water....................	Dissolve each powder in ⅓ to ½ glass of water and mix the two together.	
Before meals.................	In milk, flavored with sarsaparilla, wine or cinnamon water	Small quantity (wineglassful)	
After meals..................	In milk.....................	Large tumblerful...........	Sipped through a glass tube.
....	In water slightly flavored....	Wineglassful................	
....	In water slightly flavored....	Wineglassful................	
....	In water slightly flavored....	Wineglassful to a tumblerful.	
15 min, before bed-time..... ½ to 2 hours before bed-time. 2 to 3 hours before bed-time...	In warm milk or beer.......	Tumblerful.................	May be given per rectum in ℥ ii of boiled starch solution, injected through a catheter with a glass syringe.
After meals..................	Wine or milk................	Wineglassful................	
¾ to 1 hour after meals......	In brandy, wine or lemon juice as cocktail or as emulsion	Wineglassful...............	
....	Dissolved in glycerine or olive oil, or on a piece of bread or sugar	One or two drops...........	One or two drops placed on back of tongue.
....	Add just a little peppermint, raspberry juice or cinnamon water	In wineglass without any added fluid except for flavoring	